FRESH AND BRACKISH WATER SHRIMPS OF ECONOMIC IMPORTANCE IN THE NIGER DELTA.

by

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TABLE OF CONTENTS

INTRODUCTION

Fisheries interest in shrimps in Nigeria has been centered on the marine penaeid species harvested offshore by commercial trawlers. The importance of this group - mainly just one species, Penaeus notialis - is well known and a great deal of information is already available on it, largely due to the efforts of francophone workers (e.g. see Garoia, 1977).

By comparison, extremely little is known of our fresh and brackish water species, i.e. those supporting the traditional artisanal fisheries and most likely to include suitable candidates for aquaculture. As an example, 3 of the 9 species ranked as important in this paper have previously not even been recorded as being harvested or consumed anywhere in their ranges, and two other locally common species of economic size are new to science.

The immediate purpose of this paper is to document the species which are encountered in artisanal fisheries, give available background information on them relevant to fisheries and aquaculture work, and to provide a means for their identification in the field by non-specialists. It is hoped this will facilitate and encourage applied work. Information is also given on fisheries, but this is not the primary aim.

Scope of Coverage

The "Niger Delta" in the title reflects the geographical area of my personal experience. For purposes of identification, the scope of the paper is West African for brakcish species, and Nigerian for freshwater species. In freshwater areas outside Nigeria (and Lake Chad) one should expect to find species of Atya or Macrobrachium not treated here.

Taxonomically only "true" shrimps (Crustacea Decapoda Natantia)* are treated; their classification into families is shown in the Table of Contents. This excludes a few shrimp-like crustacea of minor or potential economic importance in the Delta: the mysids or opposum shrimps Mesopodopsis slabberi (van Beneden) and Rhopalophthalmus africana O. Tattersall; the stomatopod or mantis shrimp Squilla aculeata calmani Holthuis; and the thalassinideans or mud- or ghost-shrimps Upogebia furcata (Aurivillius) (a popular bait species) and Callichirus turneranus (White) which swarms and is fished for intensively for brief periods during peak floods in the tidal freshwater zone of whitewater rivers in the Delta.

Literature

Three other papers are closely associated with this one, and should be consulted. First is Monod (1964) who deals comprehensively with identification, distribution and fisheries of West African shrimps and crabs, based on the literature then available and his personal experience and contacts. The emphasis is on penaeid species and on the fisheries of francophone countries, but he includes useful information on Nigerian fisheries and the only available key to the larger West African shrimp species (see Okera, 1977, for an English translation of the key).

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* The usage of the terms "shrimp" and "prawn" varies in different parts of the world. For scientific purposes, they should be taken as synonymous. Holthuis (1980, pp. xv-xvi) gives a most useful discussion on the usage of the word in different countries. What are referred to as "crayfish" in West AFrican English are really shrimps. True crayfish (Decapoda Reptantia) do not occur in mainland tropical Africa, except for introduced populations in East Africa.

Second is Holthuis (1980) who provides a most complete and up-to-date world listing of species known from the literature to be of economic interest, including 12 of the species treated here. He gives information on names, useful descriptive literature references, distribution, habitat and size of each species and on its interest to fisheries. The present paper is patterned after his, with the addition of descriptions and illustrations of the species involved.

Last is a paper of my own in preparation, comprising an annotated checklist of all fresh and brackish species of shrimp known from West Africa, and illustrated key to all species known or likely to occur in Nigeria.

Economic and applies aspects

It is not possible to provide the type of information some persons will want, on the relative economic importance of various species, whether they are being over- or under-exploited, and their potential for aquaculture. Such information requires research and extension work which has not been carried out.

Those interested in catch statistics should refer to the works of Marioghae, Moses, Scott and Silvalingam cited in the bibliography, and the Annual Reports of N.I.O.M.R. As to relative importance, 9 of the 20 species listed (No.'s 1, 3, 6, 9, 10, 12, 13, 16, 17) can be ranked as important in the sense that they are harvested for selling in at least some areas; 5 of these are especially important: Penaeus notialis, Macrobrachium felicinum, M. macrobrachion, Nematopalaemon hastatus and Palaemon maculatus. Six of the 20 species (No.'s 7, 11, 14, 15, 19 and 20 are in my experience never intentionally fished for, but occur incidentally in catches of other species; at least one of these (Palaemon elegans) and perhaps two others (Palaemon species A and Macrobrachium species A) are abundant enough where they occur to be of potential importance.

On levels of exploitation, the general impression is that stocks are under-exploited, with the exception of Macrobrachium felicinum (see Osuamkpe, 1981; Osuamkpe and Powell, 1981). Information on growth and recruitment rates and catch statistics for all important species are very much needed. It should be noted that in the case of two species (Penaeus notialis and Macrobrachium felicinum) juveniles and adults are harvested by different fisheries in different ecological zones, with the result that any overexploitation by one fishery will affect the other.

As to aquaculture, the impression is that intensive culture of most species would probably not be economically feasible under present conditions in Nigeria. This is due mainly to problems of rearing larvae. However, the technology exists and if intensive culture is contemplated, one should start with library work rather than research. Most of our species have close relatives elsewhere, on which studies have already been made. In my view it would be more promising to start with direct development, or management of wild populations through habitat alterations. With these approaches the initial problems are perhaps more manageable.

SPECIES ACCOUNTS

Notes on Information Given

Scientific name

The scientific name is followed by the author of the species and date of his original description. In a few cases the species is better known under another name, which is explained under "Remarks".

FAO name

This is the English name given by Holthuis (1980), intended for use within the FAO. It is followed by the FAO code for the species, and the page citation in Holthuis (1980).

Other names

These are English names, if any, which have been used by other authors. For the species not listed in Holthuis (1980), new English names based on the FAO pattern are coined here.

Diagnosis

This section is for field identification. The characters given are those which should be visible with the naked eye or with a hand lens, and which distinguish the species from all others known to occur in Nigeria with body lengths exceeding 2.5cm. A proper taxonomic key for all Nigerian species will be available soon (Powell, in prep.); the relevant illustrations from that work are included here (Plates I - V) to supplement the diagnoses.

It must be emphasized that abnormal specimens certainly exist in the country, and undescribed species not known to me, probably do. One should be prepared to meet both.

The characters used in the diagnoses concern mainly the rostrum, the legs and colouration (Plate VI). The rostrum is best viewed laterally, by holding the specimen with the fingers of one hand and using the other to grasp the flagella of the antennules and pull them ventrally to fully expose the rostrum. Its shape and teeth can then be seen clearly against a lighted background (e.g. the sky) and its length compared to the antennal scale. Teeth, if not clearly visible, can be detected by running a pin along the edges of the rostrum.

The legs or pereopods (5 pairs) should not be confused with the third maxillipeds which may be more conspicuous or leg-like than true legs. To avoid doubt, count forward from the last (5th) pair. With small specimens, this is easier done with the specimen in water and against a dark background. In most of the Caridae listed, the 1st (in palaemonids) or 2nd (alpheids and hippolutids) legs are very slender and normally held out of sight, folded against the underside of the head.

Colouration normally must be seen on fresh specimens. The colours often change on preservation; and the patterns fade a few weeks after preservation in formalin, and much more quickly in alcohol. On live specimens, the hue of the colour and the intensity of the pattern can vary considerably due to changes in the state of the chromatophores; changes from reddish-brown to bluish-black (and vice versa) are common and patterns (especially thin lines) can disappear with the contraction of the chromatophores composing them.

The egg colours given refer to eggs in their early stages of development; the coloured yolk is used up as development proceeds. Although egg colour is normally a reliable character, cases are known (e.g. Palaemonetes africanus) of a population of normally green-egged species having red eggs.

Size

Total length as given here is the distance from the tip of the rostrum to the tip of the telson (not uropods). Often there is a size difference between the sexes, the males being larger in genera such as Atya and Macrobrachium and the females larger in Desmocaris, Palaemon and the penaeid genera.

Note that for most research work, total length is less useful than the more standard "postorbital carapace length" which is independent of rostrum length and body curvature (Plate VI).

Habitat

Most or all species have distinct salinity limits. In some cases what appears as a single species to non-specialists is actually two distinct species occupying different salinity zones (Macrobrachium macrobrachion/dux; Palaemon elegans/sp. A; Palaemon maculatus/ Palaemonetes africanus). The salinity limits given in this paper are estimates based mainly on distributions in the Bonny-New Calabar River system. They may differ in rivers with strong tidal or seasonal changes in salinity.

Fresh waters are divided into two main types: (1) whitewater, which has a conductivity high by local standards (over 40 micromhos) and includes the River Osse, the Niger and channels receiving the Niger flood waters; and (2) clearwater, with a low conductivity (below 25 micromhos) and including the Ossiomo, Jamieson, Ethiope, Sombreiro and New Calabar Rivers as well as local tributaries of the whitewater rivers. Generally clearwaters are acidic, extremely transparent, lack a mollusc fauna and sow little seasonal change in level (see Powell and Onwuteaka, 1980; Powell, 1979: 136-137). "Blackwaters" are essentially clearwaters coloured by dissolved humic substances. Rocky or torrential rivers are absent from the Delta.

The information given under each species refers only to its habitat within the Delta.

Fishery

This section gives an indication of the importance of each species, and the methods used for its capture. It is based largely on casual personal observations and informants, and is emphatically very incomplete. Generalizations are often difficult: methods vary from one area to another within the Delta, a few if any are species-specific - many gear types catch various shrimps, crabs and fish indiscriminately.

The fisheries literature, including that for areas outside the Delta is referred to, but the geographic coverage varies with species. For most species it includes at least all references known to me for Nigeria. If wider coverage is important, the reader should consult Monod (1964) and Holthuis (1980).

The most important works on shrimp fisheries within th Delta, viz. Scott (1966), Pillay (1967) and Sivalingam (1968), are often not mentioned under individual species accounts because they do not identify the species involved. They all include useful accounts of methods and gear used.

Remarks

Any miscellaneous comments and information are given here, mainly under three headings:

Taxonomy - notes on the species' taxonomic status, including any changes in scientific name and uncertainties on identification of the populations in the Delta.

Related species - mention of any other species, not listed, with which the treated species might be confused. Related species from off-shore marine waters and from freshwater areas outside southern Nigeria are excluded.

Ecology - any unusual ecological features relevant to fisheries. There is very little published information on the ecology of most of the species treated. In general shrimps tend to be detritivores or general scavengers with a preference for animal food; known exceptions are mentioned in the species accounts. Most, perhaps all, the species treated reproduce all year. Most (all those with small (0.5 - 1mm diameter) eggs except Caridina) have planktonic larvae which develop in saline waters; in freshwater species of this group, the larvae are carried downstream by river currents. In no case is the exact zone of the larval nursery grounds known. In at least some brackish species, reproductive activity is coordinated with the two-weekly tidal cycle.

Literature

This includes literature cited under the above headings as well as other references to the species. The choice of items is personal, especially where many of the references contain no new information. The primary aim has been to provide a complete bibliography of Nigerian fishery references for each species, except for the three penaeid species in which cases most of the literature is marine and only the more important references are necessarily included. However in most cases the coverage is West AFrica as far as is possible.

Much of the existing literature is likely to be in unpublished form (student projects etc.) or outside normal academic channels (government reports) and will have been overlooked by me where there has been no personal contact.

In addition to fishery references, ecological ones relevant to fisheries and aquaculture are included: these concern habitat preference, feeding, reproduction and growth. Excluded is purely taxonomic and descriptive literature; for this the reader is referred to Holthuis (1951), Monod (1964), Rutherford (1971), Okera (1977) or preferably Powell (in prep.)

1. Parapenaeopsis atlantica Balss, 1914 (Fig. 1)

FAO Name

GUINEA SHRIMP. Code: PEN Para 3. Holthuis, 1980: 30.

Other names

Brown prawn (Scott, 1966: 60)
Hardshelled coastal shrimp (Marioghae, 1980a)
Red shrimp (Adetayo, 1979: 22)
Small shrimp (Bayagbona et al., 1971: 179)

Diagnosis

Third leg chelate. Rostrum distinctly longer than antennal scale; ventral edge toothless. Fifth leg longer than 3rd or 4th. Antennal flagellum about 3 times (not 1.5) longer than body.

Pale-coloured, with antennal flagellum, legs and distal half of uropods reddish-brown.

Size

Total length of males 90mm (max. 120mm); females 140mm (max. 173mm).

Habitat

High-salinity (over 25 ppt) river mouths, and coastal marine waters.

Fishery

The species is caught in appreciable quantities in the rivermouth fisheries for Penaeus notialis and Nematopalaemon hastatus, but is of secondary importance to each of those species. Its greatest importance is in the coastal trawl fisheries.

Remarks

Ecology - This species is evidently more carnivorous than the Penaeus species. Obakin (1968) found its diet to consist mostly of various small crustaceans, especially ostracods. Data in Longhurst (1957) indicate that it is more important than other penaeids in the diet of estuarine demersal fishes.

Literature

Adetayo, 1979
Bayagbona et al., 1971
Crosnier and Bondy, 1967
Lefevere, 1971
Marioghae, 1980a
Monod, 1964
Obakin, 1968
Pillay, 1965
Scott, 1966
Thomas, 1969.

2. Penaeus (Melicertus) kerathurus (Forskal, 1975) (Fig. 2)

FAO name

CARAMOTE PRAWN. Code: PEN Pen 1. Holthuis, 1980: 47-48.

Other names

Striped prawn (Scott, 1966; Bayagbona et al., 1971)
Tiger shrimp (widespread)
Zebra prawn (Scott, 1966)
Zebra shrimp (Adetayo, 1979).

Diagnosis

Third leg chelate. Rostrum about as long as antennal scale; ventral edge with one tooth. Third leg longer than 4th and 5th.

Dark transverse bands on carapace and abdomen.

Size

Total length of males 140mm (max. 180); females 170 (max. 225).

Habitat

High-salinity (25-30 ppt) river mouths, and shallow coastal marine waters.

Fishery

This species is taken in small, usually insignificant, numbers with Penaeus notialis and Parapenaeopsis atlantica.

Experiments on its aquaculture were to be started in Tunisia (Brunel, 1976).

Remarks

Ecology - Little is known of the local ecology of this species. It deserves more attention as a candidate for aquaculture.

Literature

Adetayo, 1979
Bayagbona, 1971
Crosnier and Bondy, 1967
Lefevere, 1971
Marioghae, 1980a
Monod, 1964
Scott, 1966.

3. Penaeus (Farfantepenaeus) notialis Perez-Farfante, 1967 (Fig. 3)

FAO name

SOUTHERN PINK SHRIMP. Code: PEN Pen 5. Holthuis, 1980: 40

Other name

Grooved prawn (Scott, 1966)
Pink prawn (Scott, 1966)

Diagnosis

Third leg chelate. Rostrum about as long as antennal scale, ventral edge with usually 2 teeth. Third leg longer than 4th and 5th. Antennal flagellum about 1 - 1½ times length of body.

Colour pale grayish, with reddish-brown antennal flagella but not legs or distal half of uropods.

Size

Total length up to 113 (males) and 135 (females) mm, before migration to sea (Crosnier and Bondy, 1967). Lefevere (1971) gives the minimum male/female sizes at which migration starts as 72/85 and 96/108 for the Bays of Benin and Biafra (Bonny) respectively.

Habitat

Juveniles in river mouths and mangrove creeks etc. inland to salinities of about 5 ppt; adults in marine coastal water.

Fishery

This is the dominant species in the commercial offshore trawl fisheries. Juveniles develop in brackish water within the Delta, where they are heavily harvested with handnets etc. and are of primary importance at the artisanal level.

Remarks

Taxonomy - This species was known for a long time as Penaeus duorarum Burkenroad, 1939 and earlier as Penaeus brasiliensis Latreille, 1817. The name P. duorarum is now restricted to populations along the American (U.S.A.) and north Mexican coast; those of Central and South America and West Africa are now considered a distinct species under the new name P. notialis.

Literature

There is a vast literature on this species and the related P. duorarum, much of it rather repetitive. Most issues of the Annual Reports of the Federal Fisheries Service/N.I.O.M.R. contain information on the Nigerian fisheries. The more important papers on the ecology of West African populations are listed in Garcia and Le Reste (1981). Marioghae (1980a) reviews the Nigerian literature. Osisanya (1970) gives labelled anatomical drawings for use in school teaching.

Adetayo, 1981a, b
Bayagbona et al., 1971
Crosnier and BOndy, 1967
Garcia, 1977
Ikusemiju, 1975
Lefevere, 1971
Monod, 1964
Moses, 1980
Pillay, 1965, 1967
Scott, 1966.

4. Atya gabonensis Giebel, 1875 (Fig. 4)

FAO name

GABON SHRIMP. Code: ATY Aty 1. Holthuis, 1980: 69.

Other names

Diagnosis

Rostrum short,lacking dorsal teeth, flanked by a pair of lateral teeth. First and 2nd legs (chelipeds) reduced and specialised, appearing as mouthparts, their modified cheale (Fig. 4c) bearing brushes of setae as long as the chelae. Third to 5th legs stout, ambulatory, the third much larger than the 4th or 5th.

Colour uniformly dark greyish, no mid-dorsal stripe.

Size

Total length 12cm.

Habitat

Large whitewater rivers, in available holes, crevices and root masses. Common in the Osse and Niger/Nun rivers. Rocky bottoms are not necessary for the occurrence of this species (cf. Holthuis, 1980: 69).

Fishery

The species is harvested on a small scale in nothern Nigeria (Reed, 1967: 120, 172) as well as elsewhere in West Africa. It is reputed to have a superior flavour and was sought after by some Europeans in the Ibadan area years ago. It is of no particular importance in the Delta, due to difficulties in harvesting it in worthwhile quantities. Ijaw fishermen along the River Osse take it in lengths of bamboo set on the river bottom to catch Chrysichthys, but customarily release it, as the traditional "king" or protector of other shrimp species.

Wild populations might be managed and harvested by the provision of suitable artificial shelters.

Remarks

Related species - Atya africana Bouvier, 1904, occurs in hilly areas of Cross River State, and juveniles of it have been found in the River Nun. It is distinguished from A. gabonensis by the lack of lateral teeth on the rostrum (Fig. 4x) and the presence of a light-coloured mid-dorsal line.

Juveniles of Atya gabonensis appear superficially similar to Potamalpheops haugi which occur in the same habitat (Powell, 1979b), but are easily distinguished by the form of the chelipeds.

Ecology - Atya species use their modified chelipeds to collect fine particles from the bottom, or filter them from flowing water (see Fryer, 1977). The life cycle includes marine larval and postlarval stages.

Literature

Hobbs and Hart, 1982 (a complete review of the species).
Irvine, 1947
Monod, 1964
Powell, 1979b: 134-138; 1980
Reed, 1967.

5. Caridina africana Kingsley, 1882 (Fig. 5)

FAO name

AFRICAN CARIDINA. Code: ATY Cari 1. Holthuis, 1980: 72.

Other names

Diagnosis

The small size of this species makes field identification difficult. The best character is the form of the 1st and 2nd legs (chelipeds) which are shorter than the walking legs and which have distinctive chelae with terminal brushes of setae on the finger tips (Fig. 5). In addition, it is the only freshwater shrimp in the Delta with both a long toothed rostrum plus a row of 6 or more spinules along the edge of the transverse suture of the uropodal exopod. The two other genera of shrimps in freshwater in the Delta which have long toothed rostra are Macrobrachium (distinguishable from Caridina in the field by the large 2nd chelipeds which are held in a forward-pointing position) and Desmocaris (distinguished from Caridina by its large (2-3 rather cheliped being longer (not shorter) than the 2nd).

Size

Total length usually no more than 15 or 20mm in populations in the Delta; up to 30mm elsewhere.

Habitat

Among vegetation, submersed roots etc. in freshwater swamps, streams, backwaters of rivers throughout the Delta.

Fishery

Caridina is generally unexploited except in special situations where it is easily captured in huge numbers with fine-meshed nets or baskets. R. Freeman of the School of Humanities, University of Port Harcourt reports (pers. comm.) that the species is harvested annually from the vegetation in lakes in the central part of the Delta. Fine-meshed nets are used, and the fresh shrimp are pounded into a paste which is wrapped in leaves and cooked as a cake.

Holthuis (1980) cites Dartevelle's mention of the species being captured in rapids (an improbable habitat) near Kinshasa. J. P. Chapin (in Schmitt, 1926) describes women catching them in handnets along river banks near Kisangani.

Remarks

Taxonomy - This species shows much geographic variation in morphology. Delta populations differ from those in other parts of Nigeria; they probably represent a distinct subspecies and may also include a second species (E. Roth-Woltereck, pers. comm.).

Ecology - The feeding is described by Fryer (1960); detritus is scraped from surfaces with the setal brushes of the chelipeds. Despite the small (about 1mm) egg size, development is direct, without a larval (planktonic) stage (pers. observation).

Literature

No literature on the fisheries of this species in West Africa could be found. The genus is mentioned as part of fish diets in some papers dealing with feeding habits of fishes in northern Nigeria.

Scattered ecological references exist for West Africa (e.g. Powell, 1980; Rutherford, 1971; Troubat, 1975) but none contributes much to knowledge.

6. Desmocaris trispinosa (Aurivillius, 1998) (Fig. 6)

FAO name

(species not listed)

Other names

GUINEA SWAMP SHRIMP (proposed here).

Diagnosis

Transparent or nearly so, usually with light yellowish-brown hue; posterior half of carapace with dark vertical line; abdomen with small mid-dorsal "V" usually visible on anterior part of 3rd somite; tailfan with very small white spot on distal half of each exopod.

Rostrum straight, a little shorter than antennal scale, dorsal teeth all anterior to orbital margin. Second (major) cheliped shorter than 1st and 3rd-5th legs, and normally held ventrally with chela and carpus pointing backwards. Pleopods with long exopods (twice as long as endopod) which beat laterally, not ventrally as in other freshwater genera.

Eggs greenish, very large (2mm or more).

Size

Maximum total length 37mm.

Habitat

Freshwater stream, swamps, ponds, especially in clearwater forest area.

Fishery

In the Kwale area of Bendel State, Desmocaris is harvested annually from seasonal swampforest fishponds; some are dried and marketed locally. The species is probably widely used at the household level over much of the Delta during the dry season when they would be harvested with fish from drying swampforest ponds.

The ecology of the species gives it some potential for aquaculture.

Remarks

Related species - A very similar species, D. bislineata Powell, 1977, occurs in tidal fresh clearwater. It has carapace marking of two horizontal lines (Fig. 6x) and is glass-like in appearance, without the brownish hue of D. trispinosa.

Ecology - The species feeds on detritus or aufwuchs, and is adapted to low-oxygen swamp conditions. Development is direct.

Literature

Monod, 1964
Powell, 1976: 900; 1977, 1979a; 1980.
Rutherford, 1971.

7. Leander tenuicornis (Say, 1818)

FAO name

(species not listed)

Other names

BIOCELLATE PRAWN (proposed here)

Diagnosis

Brownish shrimp, often with a dark longitudinal streak on each side and (mainly females) 2 large eyespots on 1st and 3rd abdominal pleura.

Rostrum straight, equal or longer than antennal scale, with dorsal teeth spaced at even intervals to the tip. Second chelipeds large, with fingers of chelae longer than palm. First chelipeds with chelae relatively large, about half (not a third or quarter) as long as chelae of 2nd chelipeds.

Size

Maximum total length 47mm.

Habitat

High-salinity (over 20 ppt) zone of rivers, and probably marine littoral.

Fishery

Occasional specimens will be found among catches of other species where it occurs, but it is not common enough to be of any importance itself.

Literature

Leander has not been recorded from tropical West Africa by any other author. Monod (1964) lists it as possibly occurring off the northwest coast (Saharan); and it is listed by Powell (1980).

8. Macrobrachium dux (Lenz, 1910) (Fig. 8)

FAO name

CONGO RIVER PRAWN Code: PALAEM Macro 11. Holthuis, 1980: 90

Other names

Diagnosis

Males - Rostrum equal or slightly shorter than antennal scale; dorsal edge slightly convex over eyes, tip not upturned and without prolonged toothless portion, fewer than 11 dorsal teeth of which 1 or 2 are on carapace posterior to orbital margin. Second cheliped with carpus shorter than palm; palm much longer than fingers; fingers lacking fur-like covering, curved and gaping with 2 large teeth on basal half of each finger. Body dark with broad mid-dorsal light-coloured band extending full length of abdomen and onto carapace.

Females and juveniles - Rostrum as for males. Second chelipeds with carpus equal or shorter than chela (and longer than palm), fingers slightly shorter than palm. Sides of carapace lacking lines

characteristic of M. macrobrachion (Fig. 10) eggs about 2mm diameter, greenial.

Size

Total length rarely over 80mm. The maximum carapace length of 55mm (corresponding to total length of 12cm) cited by Holthuis (1950) is exceptional. In some localities, the maximum total length is only about 50mm.

Habitat

Freshwater streams, small rivers and some swampforest waters, usually absent from habitats of other species of the genus, and especially common in clearwater systems.

Fishery

The species is caught in hand baskets and fish traps in small quantities, but due to the small size of the water bodies it inhabits, it is usually not abundant enough to be of more than minor importance. It may be of moderate importance in areas of extensive clearwater creeks and swamps.

Inyang (1981) reported a population near Nsukka was not exploited in any way.

Remarks

Taxonomy - M. dux may be synonymous with M. raridens (Hilgendorf, 1993) M. raridens in turn is the correct name for the species called Palaemon paucidens in the older West African literature (e.g. Irvine, 1947; Reed, 1957).

Ecology - The general ecology of a population near Nsukka, Anambra State, was studied by Inyang (1981). Development is direct.

Literature

Agbasiere, 1976
Inyang, 1981
Monod, 1964
Powell, 1980.

9. Macrobrachium felicinum Holthuis, 1949. (Fig. 9)

FAO name

(species not listed).

Other names

NIGER RIVER PRAWN (proposed here).

Diagnosis

Adults - Rostrum equal or (in largest specimens) slight shorter than antennal scale; dorsal edge slightly convex over eye, with numerous (14-17) teeth of which 3-5 are on carapace, and often (especially on small and medium specimens) a straight untoothed terminal portion ending with an apical tooth.

Second chelipeds with carpus equal or longer than palm. In fully, mature males, chelae disimilar, the larger with a swollen spiny palm covered with soft fur and scattered long hairs, the smaller with the palm short and the fingers relatively long and gaping with the space between the fingers filled with stiff bristles. In less developed specimens, the left and first chelae usually show at least a difference in size and in palm/finger length ratio.

Colour ranging from transparent (young adults) to heavily mottled almost solid dark blue or brown; usually a light and a dark mid-dorsal transverse bar on posterior part of 3rd abdominal somite.

Juveniles - Rostrum as above but with untoothed terminal portion longer, exceeding antennal scale and providing a useful diagnostic character. Otherwise, identification is by elimination of other Macrobrachium species on basis of colour pattern and rostral tooth number. The gill pigment mentioned by Rutherford (1971) is also of some help.

Size

Maximum total length 80mm. Other authors give much smaller total lengths (Monod, 1964, 45mm; Rutherford, 1971, 59mm); in the Niger system specimens measuring 60-75mm are normal.

Habitat

Large whitewater rivers, both with sandy and rocky bottoms, at least as far inland as Kainji (River Niger), Federal Capital Territory (Abuja area) and Makurdi (River Benue).

Fishery

This is the most importnat species in the non-tidal zone of the lower Niger and associated rivers (Osse, Ase and Orashi). Separate fisheries exist for the adults, and juveniles.

The adults are caught by several methods: funnel-mounted basket traps especially in areas where M. vollenhovenii is also being sought; working with hand nets or baskets amongst littoral vegetation especially in the coastal zone of freshwater creeks; and use of brush traps. The latter are groups or rows of cut vegetation placed in shallow water along sandy river banks, providing shelters from which the shrimps are collected with baskets. The adult fishery extends up the Niger at least as far as Lokoja. Appreciable quantities of smoked and dried M. felicinum are sold in the riverside markets between Asaba and Lokoja.

Part of the fishery is based on irregular mass movements of adults upriver during the annual rise of flood waters (July to October). This is recorded by Osuamkpe (1980; 1981: 12; 22-23) for the Orashi River and there are oral reports of the same phenomenon and fishery on the Niger at Ndoni and Aboh. The movements involve hundreds of adults (14-15mm carapace lengths) swimming in columns close to the water surface near shore, and last about 4 hours. M. vollenhovenii as well as M. felicinum is involved. They are harvested with flat screens held in the migration route, or unbaited basket traps. The migration includes ovigerous females, the eggs of which are removed, dried, and sold separately.

Small juveniles of this species (but not others of the genus) are caught in large quantities in the freshwater zone of the main rivers of the Delta, during their mass migrations upriver from their nursery grounds in saline waters. Their migratory behaviour and the fishery is described by Osuamkpe (1981; and Osuamkpe and Powell, 1981). During the annual fall in water levels (October to January) steady streams of juveniles move along the river shores in shallow water close to the surface, and blindly enter appropriately positioned basket traps or are collected with hand-held screens. Part of the catch is smoked, to be sold in neighbouring towns.

Remarks

Taxonomy - It is possible that yet-unrecognized closely related species exist.

Ecology - The mass migration of juveniles is unusual, and apparently has not been recorded for any other species of the genus worldwide. It allows for a cheap and reliable supply of seed stock for aquaculture purposes.

Literature

Monod, 1964
Osuamkpe, 1981
Osuamkpe and Powell, 1981
Powell, 1979: 134, 137; 1980
Rutherford, 1971.

10. Macrobrachium macrobrahion (Herklots, 1851) (Fig. 10)

FAO name

BRACKISH RIVER PRAWN. Code: PALAEM Macro 32. Holthuis, 1980:98-99.

Other names

Diagnosis

Adult males - Rostrum equal or slightly longer than antennal scale, straight or with tip curved slightly or occasionally strongly upwards; often an untoothed portion near the tip followed by 1 or 2 apical teeth; 1 or 2 teeth postorbital. Second chelipeds with carpus slightly longer than palm, palm much longer than fingers which are straight and covered with fur-like dense layer of short soft hairs; chela, carpus and merus uniformly dark coloured with row of visible spines along inner margin; ischium pale-coloured.

Body dark, with dorsal parts of last 3-4 abdominal somites light-coloured; side of carapace with a dark line running from below eye towards base of 2nd cheliped.

Females and juveniles - Rostrum as for males. Second cheliped with carpus equal or longer than chela, fingers slightly shorter than palm and lacking fur. Body transparent or lightly pigmented; side of carapace with 3 vertical/oblique lines (sometimes very faint) converging towards base of 3rd-4th legs (Fig. 10). Eggs small (under 1mm diameter), greenish.

Occasional very large females resemble males.

A useful character at times is the presence of a dark blue inverted "V" or "Y" on the underside of the head, the arms of the mark encompassing the mouth. A similar mark is seen on M. dux and Palaemon elegans but not other palaemonid in the Delta.

Size

Maximum total length 125mm (Rutherford, 1971). Marioghae (MS) records 130mm; Monod (1964) 95mm; Holthuis (1980) 78mm; and Miller (1971) 74mm.

Habitat

Fresh and low-salinity (up to about 10 ppt) tidal waters, larger specimens entering but not common in lower non-tidal sections of rivers. Preferring more muddy, quiet situations than M. vollenhovenii.

Fishery

The species is caught regularly, usually in combination with other species being collected with baskets, traps, hand and push-nets, leaf-traps etc. It is the most common species of the genus in all tidal areas of suitable salinity, and throughout this zone in the Delta it is commercially more important than M. vollenhovenii. Likewise, in the Lagos Lagoon system it comprises 80% of the Macrobrachium catches (Marioghae, MS).

The lack of much mention of this species in the literature is due to identification problems which leads to its being referred to as Macrobrachium sp. or grouped with other species as Macrobrachium spp. (e.g. NIOMR, 1977: 9; Pillay, 1965; 12 and 1967: 642; Sivalingam in Monod, 1964:175; Ville, 1970a, b) or "prawns" (e.g. Scott, 1966:26-27). In some cases e.g. Pillay (1967: 642 "small shrimps of the genus Macrobrachium") what is being referred to may really be species of the smaller palaemonid genera viz: Nematopalaemon, Palaemon and Palaemonetes.

In the Bonny area, where the species occurs in streams discharging from freshwater swamps, it is not eaten (B.H. Wilcox, pers. comm.); however this is an unusual case.

Remarks

Literature

Marioghae, manuscript
Miller, 1971
Monod, 1964
NIOMR, 1978: 10
Powell, 1977: 671; 1980
Rutherford, 1971
Ville, 1970a,b
Welcomme, 1979.

11. Macrobrachium Species A. (Fig. 11)

FAO name

(species not listed)

Other names

BONNY RIVER PRAWN (proposed here)

Diagnosis

Rostrum about 25% longer than antennal scale, distal half curved upwards at 30-45° angle, no prolonged toothless portion, dorsal teeth spaced at gradually increasing intervals to the tip, usually 3 of them posterbital.

Second cheliped with carpus longer than palm, palm in females and juveniles slightly swollen and very slightly shorter than fingers (in large males, palm much longer than fingers), fingers straight, probably covered with fur (of M. macrobrachion) in largest males. Eggs small, amber coloured.

Overall colouration light brown, with banded legs and extremely conspicuous black and yellow mottling on 2nd chelipeds. Abdomen uniformly coloured with (in females) pale transverse bar dorsally on posterior half of third abdominal somite; carapace coarsely speckled in both sexes, lacking the lines characteristic of M. macrobrachion or M. vollenhovenii (Figs. 10 and 12).

Size

Total length at least to 60mm.

Habitat

High-salinity mangrove channels or river mouths.

Fishery

Unknown. The species is so far known only from the Bonny area where Macrobrachium is not eaten (see under M. macrobrachion). It may well occur elsewhere, or may have been confused with M. macrobrachion by some previous workers.

Remarks

Taxonomy - This is a new species, related to M. macrobrachion. It will be fully described and named in due course: in the meantime it should be referred to in literature as "Macrobrachium species A, of Powell, 1982".

Literature

Powell, in prep.

12. Macrobrachium vollenhovenii (Herklots, 1857) (Fig. 12)

FAO name

AFRICAN RIVER PRAWN. Code: PALAEM Macro 49. Holthuis, 1980: 106-107.

Other names

Diagnosis

Rostrum equal or (more usually in adults) shorter than antennal scale; dorsal edge convex over eye; tip lacking prolonged toothless portion.

Second chelipeds with carpus shorter than palm, movable finger with (in large adults) a single large tooth at midlength of finger.

Colour generally pale without speckling or mottling; thin dark longitudinal lines on carapace and transverse ones on abdomen as shown on Fig. 12; also a thin unbroken line along ventral margin of carapace. Third maxillipeds bright yellow (white in small juveniles). Fingers of 2nd cheliped dark blue, with yellow patch at articulation with palm; tips of fingers white in juveniles.

Eggs red or orange.

Size

Total length usually 100-150mm; maximum 189 (Rutherford, 1971).

Habitat

Fresh and low-salinity (up to about 10 ppt) waters, including mangrove creeks and inland rivers of all types excepting clear- and blackwaters. As far inland as Oyo, Lokoja and Ogoja areas. In Lagos Lagoon it occurs in salinities as high as 19% (Marioghae, MS).

Fishery

This is the largest and best-known freshwater shrimp in West Africa. However it is probably less important than M. felicinum and M. macrobrachion, with which it occurs. (see accounts under those species).

In fresh waters of the Delta, the most usual method of capture is by basket traps set along river banks. This is done mainly by women operating from canoes; the yield includes M. felicinum and in places M. macrobrachion. In the Lagos Lagoon system, the fishery appears more important: it is reported (NIOMR, 1978; Marioghae, personal communication) there are full-time M. vollenhovenii fishermen earning up to ₦30-50 daily during the peak season. The catch however may consist mostly of M. macrobrachion (see under that species).

In brackish areas of the Delta, the species is taken in leaf-traps (described by Scott, 1966:83), a method used also in the Ivory Coast (Ville, 1970a: 253). The method is not aimed at M. vollenhovenii in particular, and M. macrobrachion and other smaller palaemonids are usually more important in the catch. Specimens are also taken in brush-traps used for M. felicinum on the Niger at Asaba.

There have been a number of projects started to culture this species; I am not aware of anything having come from any of them. In some cases, if not all, the workers were not aware that the larvae require brackish water for development; in others there has been taxonomic confusion.

Remarks

Literature

The following list is certainly incomplete, lacking at least some student dissertations for which I do not have full details. In some of such literature, the identifications may be open to question. Some literature (not cited) exists on insecticide toxicity.

Etta, 1970, 1972.
Marioghae, manuscript
Miller,1971
Monod, 1964
Powell, 1979: 134, 137; 1980
Prah, S.K.
Rutherford, 1971
Ville, 1970; 1971a, b; 1972a, b.

13. Nematopalaemon hastatus (Aurivillius, 1898) (Fig. 13)

FAO name

ESTUARINE PRAWN. Code: PALAEM Nemat 2. Holthuis, 1980: 107.

Other names

White Shrimp (Scott, 1966: 60; Lefevere, 1970: 3)

Diagnosis

Transparent shrimp (quickly turning opaque white when dead) with 4th and 5th legs exceptionally long (exceeding body length) and filamentous.

Rostrum with needle-like upturned end, about twice as long as antennal scale, dorsal teeth restricted to thick basal part of rostrum. Second chelipeds long and slender, fingers of chelae as long as palm and carpus combined. Eggs small, yellow.

Colour restricted to red on inner antennular flagellum and on tailfan, and short vertical bluish line at base of each pleopod..

On small specimens, needle-like prolongation of rostrum much less developed.

Size

Maximum total length 75mm, more usually under 65mm.

Habitat

Pelagic, in high-salinity (over 15 ppt) river mouths, large creeks and coastal waters, but not extending more than a few kilometers upriver even if the salinity is adequate (Marioghae, 1980b).

Fishery

Holthuis (1980: 107) cites a number of authors reporting this species to be caught in important numbers, and indicates (from Monod, 1964: 136 and Longhurst, 1970: 278) that the fishery is usually carried out with seines.

In the Niger Delta the fishery is a specialized one involving professional fishermen and a variety of gear types. Most of these are nets or traps which filter the shrimps and other organisms from tidal currents at the river mouths (Pillay, 1967: 644; Scott, 1966: 28-29, 83; Sivalingam, 1968: 5-6 and for detailed descriptions, Marioghae, 1980b).

According to Sivalingam (1968:6) N. hastatus (which he had not identified and called "the tiny shrimp" in distinction from panaeid prawns) makes up three-quarters of the catch of such filter traps or nets. Scott (1966:29) gives the annual landings by such traps in the Delta (Forcados to Bonny Rivers) to be 1125 tons. Both Sivalingam and Marioghae (1980b) made estimates of catches which give a figure of about 35kg of N. hastatus per fisherman per day. Marioghae gives more detailed statistics on catches and incomes in relation to trap-type, geographic area and season, and estimates (1980b; 1981 the possible annual income of fishermen to be ₦6-30,000. Scott (1966:28) estimated a daily catch of only 1-10 lbs (dry weight?) for a fisherman operating 40-50 basket traps (akokobi).

The catch is sun-dried or smoked, and marketed over much of inland Nigeria as "crayfish", which is ground and used as a condiment in cooking.

Remarks

Taxonomy - The species is known in the literature under the name Palaemon hastatus Aurivillius. Nematopalaemon Holthuis was the subgenus of Palaemon containing the species hastatus; it is now given full genus rank.

Ecology - The feeding and reproductive ecology of the species is treated by Marioghae (1980b). It is a carnivore, feeding of myside and calanoid copepods. Spawning and egg-hatching follow semi-lunar rhythms. He also deals with its importance in the diet of coastal fishes.

Literature

Crosnier and Bondy, 1967
Deekae, 1981
Lefevere, 1970
Marioghae, 1980b, 1981a, b
Monod, 1964
Pillay, 1967
Powell, 1980
Scott, 1966
Sivalingam, 1968.

14. Palaemon elegans Rathke, 1837 (Fig. 14)

FAO name

ROCKPOOL PRAWN. Code: PALAEM Palaem 4. Holthuis, 1980: 110

Other names

Diagnosis

Transparent shrimp with colour pattern of thin dark lines, several equally-intense transverse ones across abdomen (cf. next species), and longitudinal and oblique ones on carapace; number of lines increasing with body size.

Rostrum toothed, equal or slightly longer than antennal scale: ventral border deeply convex; dorsal margin straight or only slightly upcurved at end, with 9-11 (not 12-16) dorsal teeth.

Legs (including chelipeds) with reddish pigment at joints; second chelipeds with carpus longer than palm.

Eggs green or brownish green. Pleura of ovigerous females bearing extensions of 4 dark vertical lines from the abdomen. and some white patches.

Size

Maximum total length 38mm in Niger Delta; about 60mm in Europe.

Habitat

High-salinity (over 20 ppt) creeks and river mouths, along eroding banks, mangrove roots and in beach pools; also marine littoral.

Fishery

Holthuis (1980) lists this species as of minor importance in Europe. There is no report of it being specifically fished for in tropical West Africa.

It may be found incidentally in catches of Palaemon maculatus (see account under that species) or other small palaemonids. It is abundant where it occurs, but most often this is in difficult situations (steep banks with strong wave action; among mangrove roots) and in areas where more easily harvested species such as Nematopalaemon hastatus occur.

Remarks

Literature

Lagardere, 1971
Monod, 1964
Powell, 1980.

15. Palaemon species A (Fig. 15)

FAO name

(species not listed)

Other names

BLACKEGG PRAWN (proposed here).

Diagnosis

Transparent shrimp with thin dark transverse line across posterior edge of 3rd abdominal somite, more intense than any other such line (if present) on other somites; and a short dark vertical (not oblique) line in middle of posterior half of side of carapace.

Rostrum toothed, longer than antennal scale; ventral border not exceptionally convex; dorsal margin usually strongly curved upwards (about 30° angle) from midlength, with 6-7 teeth followed by an untoothed portion and an apical tooth.

Legs (including chelipeds) uncoloured, lacking reddish pigment at joints.

Eggs dark olive, appearing black. Pleura of ovigerous females with 4 dark vertical bars (the last one an extension of the transverse abdominal line), and large conspicuous white patches.

Size

Maximum total length 36mm.

Habitat

Medium-salinity (about 5-20 ppt) creeks, along eroding banks and mangrove roots.

Fishery

Specimens are often found in catches of Palaemon maculatus (see account under that species). As with Palaemon elegans, the habitat preference of this species makes harvesting by traditional means more difficult than for other species.

Remarks

Taxonomy - This is a new species, the mesohaline equivalent of Palaemon elegans. Until it is described fully and named, it should be referred to as "Palaemon species A, of Powell, 1982".

Literature

Powell, 1980
Powell, in prep.

16. Palaemon maculatus (Thallwitz. 1891) (Fig. 16)

FAO name

ZAIRE PRAWN. Code: PALAEM Palaem 8. Holthuis, 1980: 112.

Other names

Diagnosis

Transparent shrimp lacking conspicuous pigment lines on carapace or abdomen (very faint lines as shown in Fig. 16 may be present). Small but conspicuous black-and-white pigment body in end of last abdominal segment.

Rostrum toothed, straight and narrow, ending in a needle-like toothless portion which extends beyond antennal scale.

Second cheliped slender, overreaching antennal scale by length of chela or more.

Eggs dull green. Pleura of ovigerous females with thin white ventral border.

Live specimens leap more actively than other similar species; they often leap from the water to avoid capture.

Size

Maximum total length 43mm. In some localities, especially near the coast, only small specimens (including ovigerous females) the size of Palaemonetes africanus, are found.

Habitat

Medium and high-salinity (above about 10 ppt) mangrove creeks especially along quiet muddy shores.

Fishery

This species is harvested regularly by women using handnets and leaftraps, and also is taken among the catch of tidal fish fences. It is used as bait, and is sold in local markets fresh or dried as "crayfish". Depending on the habitat and salinity zone, specimens of Palaemon species A, Palaemonetes africanus and Macrobrachium spp. juveniles are included in the catch. Either P. maculatus or Palaemonetes dominates in the catch; no distinction is made between them.

The only literature reference to P. maculatus being utilized) (other than Powell, 1980) is apparently that of Dartevelle (1950) cited by Holthuis (1980), for Zaire.

Remarks

Literature

Dartevelle, 1950
Powell, 1979b:127; 1980.

17. Palaemonetes africanus Balss, 1916 (Fig. 17)

FAO name

Other names

CREEK SHRIMP (proposed here)

Diagnosis

Transparent shrimp lacking definite pigment lines on carapace or abdomen. Dark brown (not black-and-white) pigment body in end of last abdominal segment.

Rostrum toothed, dorsal edge convex with teeth, ending in a short straight toothless portion sometimes reaching but not overreaching end of antennal scale.

Second cheliped poorly developed, barely reaching end of antennal scale.

Eggs light green. Pleura of ovigerous females with thin blue ventral border.

Size

Maximum total length 31 mm.

Habitat

Low-and medium-salinity (about 1-20 ppt) waters, especially in quiet shallow areas with muddy substrate.

Fishery

This is the low-salinity equivalent of Palaemon maculatus, and is harvested and used similarly. Large numbers are sold in Warri market. In that area the species is caught with a flat lift net which is lowered to the bottom in shallow water and lifted after a short time.

Remarks

Ecology - Fecundity was studied by Deekae (1981). The male: female ratio was about 1 : 2, and about 60% of females were ovigerous at a time.

Literature

Deekae, 1981
Powell, 1977; 665; 1979: 127; 1980.

18. Alpheus pontederiae Rochebrine, 1883 (Fig. 18)

FAO name

(species not listed)

Other names

MANGROVE SNAPPING SHRIMP (proposed here)

Diagnosis

Dark greenish- or bluish-brown stout-bodied shrimp, with large unequal chelae: one (left or right) slender, and the other oval-rectangular and about the size of the specimen's thorax.

Eyes reduced, not stalked, covered by transparent anterior portion of carapace. Rostrum a short simple pointed process.

First chelipeds slender at base, bearing disproportionately large chelae as described above; 2nd chelipeds very slender with very small chelae, held folded out of sight.

Eggs reddish brown.

Size

Maximum total length 55mm (Schmitt, 1926).

Habitat

Medium- and high-salinity waters, intertidal and subtidal, living in systems of burrows especially in soft mud.

Fishery

This species is widely sought for as bait. They are caught at low tide by puddling the mud in which they occur, which action destroys their burrow systems and compels them to emerge at the surface.

They are generally not consumed but a few individuals are often found among dried shrimps of other species in markets. The Ogonis are reported to eat them.

Pang (in Schmitt, 1926: 23) wrote, concerning this species at Banana Bay, Zaire: "The natives take not the slightest interest in them".

Holthuis lists 12 species of the genus in his listing, none of which is ranked as important.

Remarks

Related species - Two other snapping shrimps (Alpheus intrinsecus and Synalpheus senegambiensis) occur in the Delta. Both have eyes and chelae similar to A. pontederiae, but they are small and very pale coloured. A intrinsecus is found in river mouths: S. senegambiensis penetrates inland to medium-salinity waters and is a commensal of sponges.

Ecology - This shrimp uses its large claw to produce the snapping noises, resembling the breaking of dry sticks, frequently heard in mangrove swamps. Gobies and swamp eels are often associated with their burrow systems.

Literature

Crosnier and Forest, 1966
Powell, 1977: 127.

19. Exhippolysmata hastatoides (Balss, 1914) (Fig. 19)

FAO name

COMPANION SHRIMP. Code: HIPPO Exhip 3. Holthuis, 1980: 125.

Other names

Red-tailed shrimp (Scott, 1966: 60)

Diagnosis

Shrimp with pale red transverse bands across abdomen and reddish tailfan.

Rostrum nearly or about twice as long as antennal scale; its basal portion (above eye) convex and toothed; the remainder slender, straight, slightly upturned and with central teeth only.

First and second chelipeds short (=postorbital carapace length or less). Third to 5th legs normal, not abnormally long and threadlike.

In fresh catches, specimens are easily separated from Nematopalaemon hastatus by their red stomachs, visible through the carapace. Lysmata species A is similar in appearance, but the red bands are more intense, and its rostrum much shorter.

Size

Maximum total length 73mm, most specimens not over 65mm.

Habitat

High-salinity river mouths (and shallow coastal water) in association with Nematopalaemon hastatus.

Fishery

Small numbers of this species are regularly found in catches of Nematopalaemon hastatus. Because of this, Longhurst (1970, cited by Holthuis, 1980) indicates the species to be of importance.

Monod (1964: 138) cites Longhurst (pers. comm.) as estimating it to comprise only about 1% of the N. hastatus catch at Lagos. A similar figure (rarely more than 1%) is given by Lefevere (1970) presumably also for the Lagos area; and it obtains also at Bonny.

Remarks

Taxonomy - This species has been known previously under the names Mimocaris hastatoides Balss and Hippolysmata hastatoides (Balss).

Ecology- The nature of this species association with Nematopalaemon hastatus is not known. The consistently red stomach contents suggest a special diet.

Literature

Lefevere, 1970
Monod, 1964
Powell, 1980
Scott, 1966.

20. Lysmata uncicornis Holthuis and Maurin, 1952. (Fig. 20)

FAO name

(species not listed)

Other names

BANDED SHRIMP (proposed here)

Diagnosis

Shrimp with red transverse bands across abdomen, resembling Exhippolysmata hastatoides but with rostrum very short (less than half length of antennal scale) and toothed.

Size

Total length about 35mm, maximum probably larger.

Habitat

High-salinity river mouths, and probably shallow coastal water.

Fishery

Specimens of this species have been collected with Nematopalaemon hastatus and Exhippolysmata hastatoides at the mouths of the New Calabar and Bonny Rivers. It is thus likely to be encountered in fisheries work, but is of no known importance. It is possible that fisheries references to E. hastatoides actually refer in part to this species.

Remarks

Taxonomy - The assignment of this species to L. uncicornis is tentative, pending more detailed comparison.

Literature

Lagardere, 1971.

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LIST OF FIGURES

PLATE I

Fig. 1. Parapenaeopsis atlantica (modified from Crosnier and Barrit, 1966)

2. Penaeus kerathurus (after Crosnier and Bondy)

3. Penaeus notialis (after Crosnier and Berrit)

PLATE II

Fig. 4. Atya gabonensis: a, lateralview, (after Koelbel, 1884)
b, dorsal view of head (after Hobbs and Hart, 1982)
c, cheliped of Atya sp. (after Hobbs and Hart, 1982)

4x. Atya africana, dorsal view of head, (after Hobbs and Hart, 1982)

5. Caridina, form of 1st and 2nd chelipeds

6. Desmocaris trispinosa ovigerous female (after Powell, 1977)

6x. Desmocaris bislineata (after Powell, 1977)

7. Leander tenuicornis, female, CL 6.2mm, from Bony River.

PLATE III

Fig. 8. Macrobrachium dux, male CL 16mm, TL 61mm, from Sombreiro River, dorsal and lateral views.

9. Macrobrachium felicinum, male CL 18mm, TL 57mm from R. Osse(?) dorsal and lateral views.

10. Macrobrachium macrobrachion, left: male CL 14mm TL 60mm right: male CL 20mm, TL 80mm.

11. Macrobrachium species A, female CL 11mm, TL 47mm.

12. Macrobrachium vollenhovenii, male CL 15mm, TL 55mm.

PLATE IV

Fig.13. Nematopalaemon hastatus (modified from Aurivillius, 1898)

14. Palaemon elegans, ovigerous female, CL 7.3mm.

15. Palaemon species A, ovigerous female, CL 6mm.

16. Palaemon maculatus, ovigerous female, CL 5.7mm.

17. Palaemonetes africanus, ovigerous female, CL 5mm.

PLATE V

Fig.18. Alpheus pontederiae: a, diagramatic dorsal view.

b, dorsal view of head, and ventral view of chelae, (after Crosnier and Forest, 1966).

19. Exhippolysmata hastatoides, ovigerous female CL 7.2mm: anterior region, and 1st-3rd legs (legs at twice magnification of anterior region).

20. Lysmata uncicornis (after Holthuis and Maurin, from Lagardere, 1971).

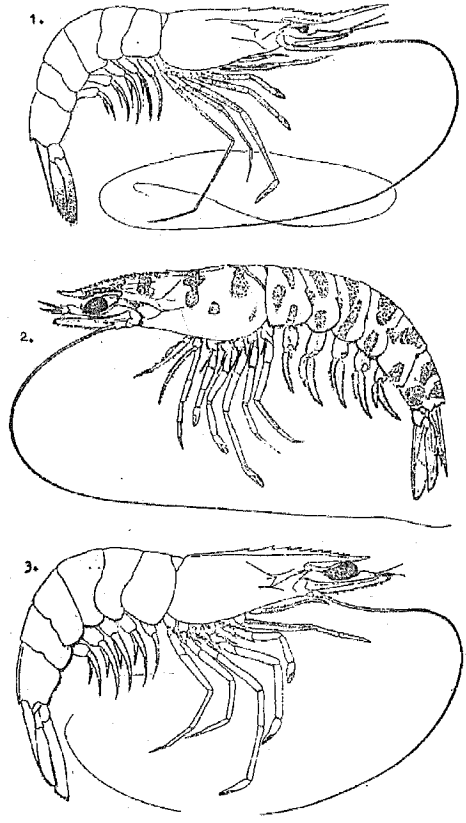
PLATE VI

Diagram of palaemonid shrimp, showing features mentioned in text.

Note: Unless otherwise specified, figures are original and are based on specimens from the Bonny-New Calabar River system.

Abbreviations: CL = postorbital carapace length; TL = total length.

PLATE I



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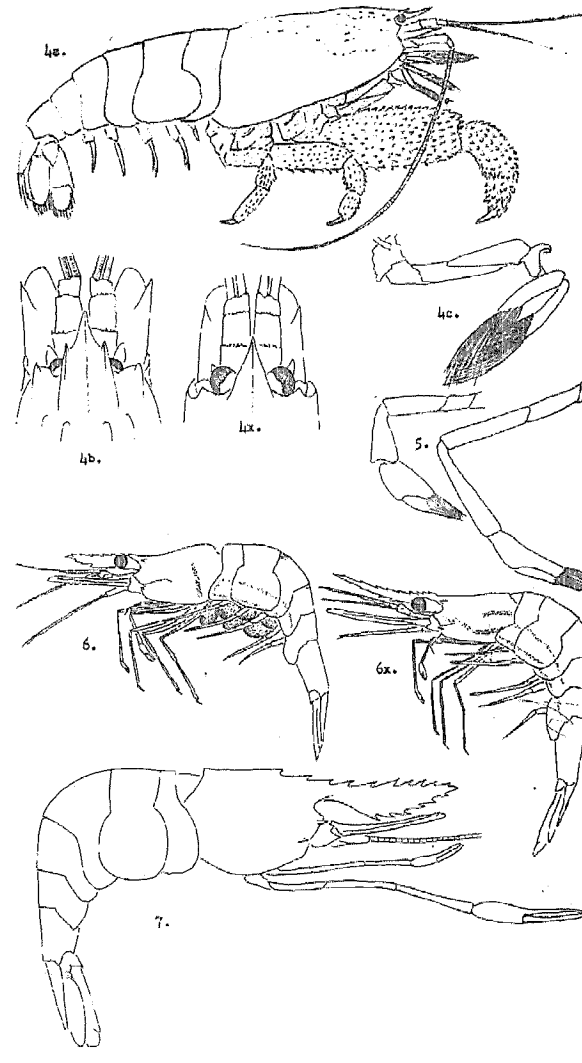

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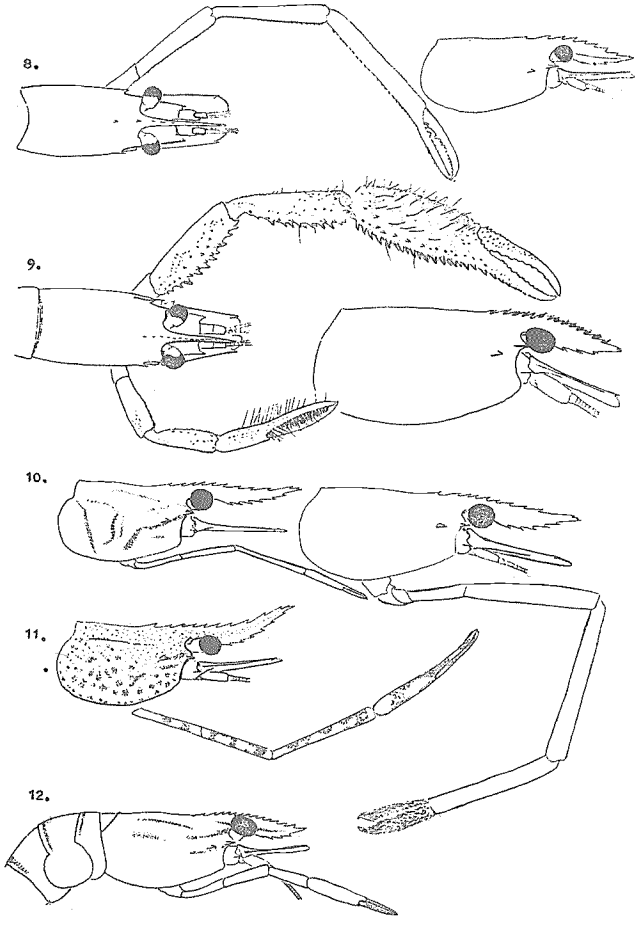

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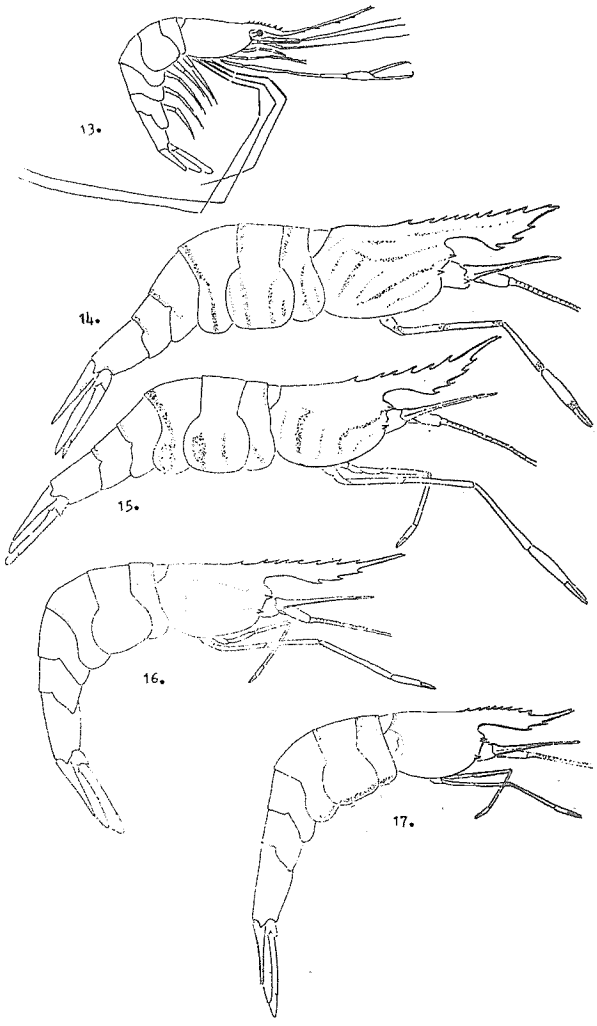

PLATE V

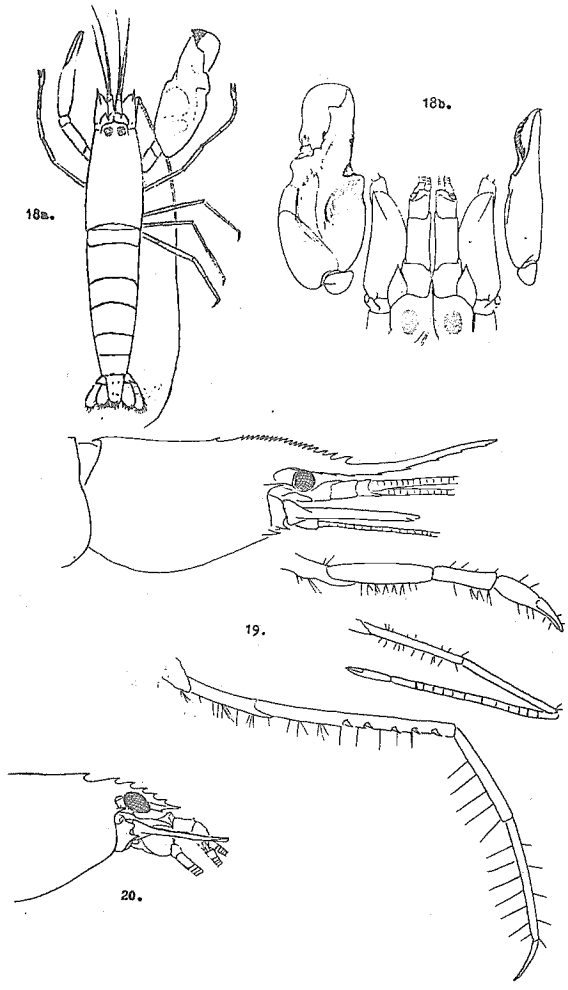

PLATE VI

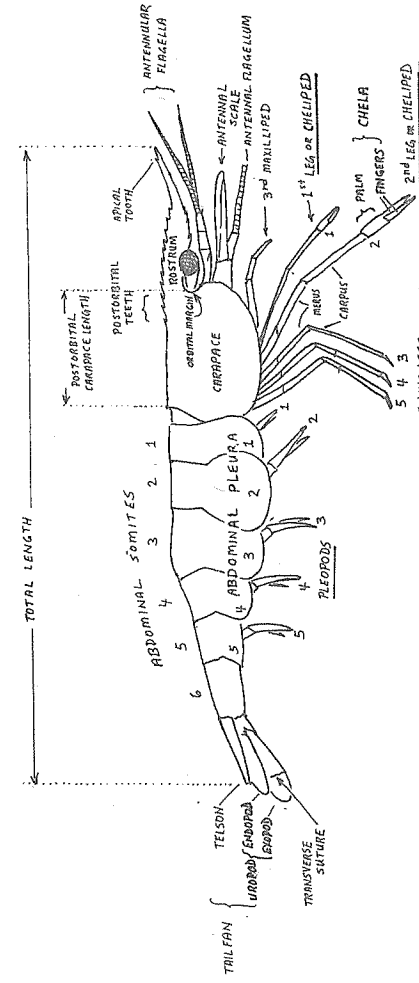

Diagram showing features mentioned in text.